

-continued

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34

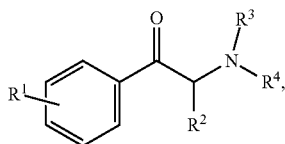
We claim:

1. An aptamer-based sensor comprising a cross-reactive aptamer for synthetic cathinones, the cross-reactive aptamer comprising SEQ ID NO: 17 or a sequence sharing at least 95% identity with SEQ ID No: 17.

2. The aptamer-based sensor according to claim 1, the cross-reactive aptamer comprising SEQ ID No: 6, 18, or 19.

3. The aptamer-based sensor according to claim 1, the cross-reactive aptamer being SEQ ID No: 6, 18, or 19.

4. The aptamer-based sensor according to claim 1, the synthetic cathinone having a core structure of



wherein R^1 is selected from the group consisting of hydrogen, alkyl, aryl, heteroaryl, cycloalkyl, cycloalkenyl, heterocycloalkyl, alkenyl, alkynyl, alkoxy, haloalkyl, acyl, halogen, and hydroxylalkyl, or R^1 , taken together with the carbon atom to which it is attached and an adjacent carbon atom, form a substituted or unsubstituted 5- or 6-membered homocyclic or heterocyclic ring;

R^2 is hydrogen or alkyl; and

R^3 and R^4 are each independently selected from the group consisting of hydrogen, alkyl, aryl, heteroaryl, cycloalkyl, cycloalkenyl, heterocycloalkyl, alkenyl, alkynyl, haloalkyl, acyl, halogen, and hydroxylalkyl, or R^3 and R^4 , taken together with the nitrogen atom to which they are attached, form a substituted or unsubstituted 5- or 6-membered heterocyclic ring.

5. The aptamer-based sensor according to claim 4, the synthetic cathinone being selected from 3,4-methylenedioxypropylvalerone (MDPV); α -PVP; pyrovalerone; methylone; pentylone; 3,4-methylenedioxy- α -pyrrolidinobutylphenone (MDPBP); mephedrone; 4-methyl- α -pyrrolidinobutylphenone (MPBP); 4'-methyl- α -pyrrolidinohexanophenone (MPHP); naphyrone; methedrone; ethylone; butylone; 4-methylmethcathinone (4-MMC); 4-fluoromethcathinone (4-FMC); 3-FMC; methcathinone; and 4-methyl- α -pyrrolidinobutylphenone (MEPBP).

6. The aptamer-based sensor according to claim 1, the cross-reactive aptamer being modified with a reporter label selected from a fluorescent dye, a fluorescent or luminescent nanoparticle, and an affinity tag.

7. A method for detecting a synthetic cathinone in a sample, the method comprising contacting the sample with the aptamer-based sensor of claim 1, the aptamer-based sensor further comprising a dye, and detecting the presence